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The Machines That Never Stop

By J. Hopkins

Reprinted from THE AMERICAN MONTHLY REVIEW OF REVIEWS

January, 1907

All WALTHAM Watch Movements

Are guaranteed to be made of the best materials and upon the most approved principles. For any defect in material, workmanship or performance under fair usage, the

Waltham Watch Company

Waltham, Mass.

Holds itself at all times responsible. This guarantee is without time limit and holds good the world over

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THE MACHINES THAT NEVER STOP.

AN AMERICAN ROMANCE—HOW YANKEES WORKED THE MOST DIFFICULT MANUFACTURING PUZZLE IN THE WORLD.

BY J. HOPKINS.

"A just pride in what you really can honestly do yourself."—Ruskin.

YOU know how to tell a man's pride. Ask him what he wants to leave his son.

The Oriental's ideal is *good living.* He would answer "My guarded palace,—slaves,—women,—jewels."

The European is proudest of *good position.* He would answer: "My title,—estates to support it,—honors in politics or art."

But the significant pioneer American thinks most of *good will,* because over here it is hardest to get. He would say: "I want my boy to have my business, and enough capital to run it and the reputation my product has made."

THE FINEST LEGACY IN THE WORLD.

So the son gets not ease, or vanity, but responsibility,—the finest legacy there is.

Elihu Root once spoke of "that priceless solace of old age,—the respect and affection of the community that makes up one's world."

Right. "The Almighty Dollar" is not really as much an end as a means. The American industrial impulse, finally analyzed, is not to make money; it is to "make good." It is the pioneer passion to conquer prejudice, work mechanical marvels, "do it first," and thereby earn the value of respect for a trademark or a name.

For example: Half a century ago, "American watch" was a term of contempt, at home and abroad. To-day it is the standard of pocket timepieces from Christiania to Cape Town, from Melbourne to New York. To its accuracy and honesty the whole world pays respect and good will. These were earned through a romance of strenuous effort and growing success.

"HE WAS GOING TO MAKE WATCHES THE WAY THEY MADE MUSKETS DOWN AT SPRINGFIELD,—BY MACHINERY."
(Aaron Dennison, the brilliant inventor of American watch machines.)

DARING INVENTION AND DARING ADVENTURE.

No other manufactured article is so minutely intricate of detail and so constantly in use as a watch. It is the only machine that never stops. Aaron Dennison, of Maine, certainly showed his nerve when he built a shop by the Charles River, near Boston, in 1854, and said he was going to make watches the way they made muskets down at Springfield,—uniform, interchangeable, and by machinery.

Smash came his assignment in '57. "Of course," said the world. Why, all sensible people knew that Europeans, especially the Swiss, made all the good watches. To construct such complicated mysteries it took the patient art and strange handicraft of these peasants in the shadows of the Alps, one family pottering at wheels, another making regulators, another shaping jewels, another cases, until some one with a little money could visit around, collect the ingredients, and have them assembled.

DENNISON'S WATCH SHOP, 1854.
(Half a century later, on this same spot by the Charles River, was taken the picture shown on the opposite page.)

Naturally, no two of these watches were ever alike; one out of order cost as much to repair usually as a new one. They weren't regular, either, being the work of many unorganized hands.

But that was the only way to do it. "The idea of punching out an entire watch under one roof! Cheap and nasty machine methods!" was the cry of 50 years ago.

Just one little enterprising band, however, saw the point. Although nobody would buy Dennison's watches; although his newfangled lathes and drills, his payroll of 90 hands a week, had wrecked his financial backing,—still, *he had made watches,*—five a day—good watches.

BANKRUPTCY TO SUPREMACY.

What happened next is the romance of a civilization-making American invention, equaled in interest by few. Capital backed up genius, and didn't know when it was licked. Seven lean years came between the building of the shop and the first dividend, but energy and intellect finally won.

On the very spot of the first failure, I stood the other day before an 820-foot brick façade, behind which Dennison's associates and successors, who have worked out his plan to the last wheel and screw, and improved it by experimentation costing hundreds of thousands of dollars, are now turning out some 3500 standard American watches every day. It is the largest watch factory in the world. Its frontage within another year will run over a thousand feet.

From the seven acres of floors within this one building start three-quarters of all the American watches that are exported. A capital of $12,000,000 is actively employed in making watches, in regulating them by the finest observatory and clockroom that science has yet fitted out, and in tireless experiments for "the improvement of the breed."

Eli Whitney's cotton gin changed the South from a happy hunting ground to an agricultural empire.

S. F. B. Morse's telegraph tied together the ends of the world.

McCormick's reaper made the Northwest the international bread-box.

Westinghouse's airbrake has saved the lives of thousands.

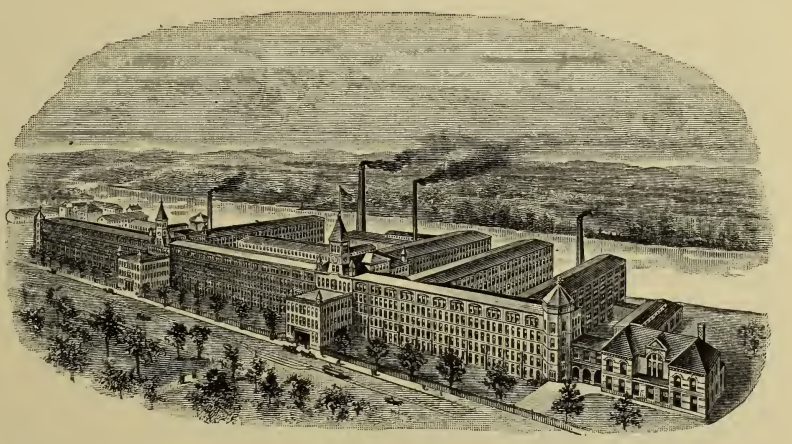
Edison's phonograph has brought classic entertainment to every hamlet in America; by his incandescents millions of people play and work every night.

MAN'S MOST INTIMATE COMPANION.

To the enterprise that produced such famous stepping-stones on our march to civilization, Americans freely give their good

will. Here is the tale of just as epochal an enterprise. Though in capitalization, watch manufacture is tiny compared to the big "industrials," like iron and steel, or to public utilities, such as railroads and gas works, yet the watch is the most intimate companion of man,—more constant than his clothing, more consulted, deferred to, and relied upon than his doctor and lawyer.

"My bosom friend," Edward Eggleston called his watch. An engagement missed may be a fortune lost. Time is money for busy people. Think what it has meant to the army, who, increasing for half a century until now they number nearly 15,000,000, have carried the sure-time watches, guaranteed by the makers *for good*, that have been produced better and better, cheaper and cheaper, by Dennison's successors at Waltham!



THE LARGEST WATCH FACTORY IN THE WORLD.

A NATIONAL INSTITUTION AT WALTHAM.

Ralph Waldo Emerson, describing a man of great use to his community, said: "He is put together like a Waltham watch."

So the plant at Waltham is more than a private enterprise; it contains a national institution, for more reasons than the mere offer to every one of a reliable watch at a reasonable price, and the example of the most difficult manufacturing problem in the world tackled triumphantly by Americans.

In the first place, the history of this watch is the history of the American watch. Most of the basic inventions upon which rest the prosperity of the trade have been not only created by Church or Marsh, the Waltham inventors who succeeded Dennison, but also actually constructed in the company's shops. "Many a time," said one gray-haired superintendent, "the company would gamble $2500 or $3000 on a new idea for a machine, —and before its completion found that its inventor had worked out a different and even better process. The cash was always forthcoming for another trial."

This patronage of genius, of course, supplied the rest of the watch trade with a sort of free experimental laboratory. Thus it worked really under more favorable conditions than the pioneers. The fact that many competitors have died away, and that even the foremost of those remaining fail to equal in importance the original inventors, marks the survival of the fittest,—inventive resource plus business judgment.

During any day of the 50 years of the Waltham watch's success, its place could have been taken by the product of any other man or men equally competent to hold together capital and genius. If inventors of the stamp of Dennison, Church, and Marsh could have been found; if executives like Royal E. Robbins and E. C. Fitch had become the devoted and lavish patrons of such genius; if the intense personal application of all concerned had equaled that which has built up the largest watch factory in the world at Waltham, an equal success in watchmaking could have been obtained.

The nature of this business precludes the control of the source of supply, as might be the case in oil or gas or natural staples; nor can any monopoly of trade conditions be secured by unjust franchise or conspiracy. There are over 25,000 retail watch dealers in the United States at present, and over 150 recognized jobbers. *These tradesmen will sell any clock or watch or jewel upon which they can make a profit.* The Waltham has obtained its pre-eminence simply because it is a permanently guaranteed watch, and has lived up to its guarantee better than any other.

The same grade of instrument which 40

years ago the company sold only at a fair profit for $200, now may be purchased for $65, and it is a better watch, by reason of the brilliant achievements in business organization and in new machinery and methods which its makers have developed during those 40 years.

SHOWING THE WAY ABROAD.

So much for the benefit to its own trade in America. Abroad we find just as striking a leadership.

Practically the whole brunt of converting South America, Europe, Asia, Africa, and Australia to the "American watch argument" was assumed by the Waltham. At first, foreigners had only scorn for "American machine methods." Actual proof of vast superiority over the cheap Swiss watches, tremendous salaries to traveling men, bills never collected, losses in a dozen ways, confronted the expansionists opening up these new channels.

The Land of Mañana gave a severe bump to the would-be exporters. "Bring on your watches," they said in South America. "We buy nothing we can't see." So two travelers left Waltham with four trunks full of watches. These were purchased,—on credit. Some of the money yet remains to be seen by the exporters!

The pioneers were not quitters, however, as we have noticed. To-day the sun never sets on the wearers of American watches. And of the foreign-worn, over three-quarters are Walthams.

This business push of the firm that had experience and a running start soon opened the world markets to the rest of the watch trade, which was financially unprepared to put up cash on such long investments.

Nor were export walls battered down in this one line alone. A hundred branches of American industries have found the way abroad prepared or smoothed as a result of the vigorous Waltham campaign. A Waltham office was opened in Australia 30 years ago; in the Straits Settlements, Japan and China, Walthams were leaders. They are on sale in nearly all European countries. The phrase "Made in America" has taken on a new dignity wherever they have appeared.

BUILDING UP A TOWN.

Another beneficial result of this private enterprise is the development of Waltham, Mass. When Dennison first arrived it contained about 6000 people. Now it is a busy town of 30,000, three-quarters of whom are directly or indirectly dependent upon the makers of the Waltham watch.

And how proud the 4200 operatives are!—proud of their skill and of their part in the largest watch factory in the world. There have never been labor troubles at Waltham, because differences are settled by friendly consultation. So there has never been a strike. The company maintains a boarding-house for women, and a mutual relief association,—connection with which, by the way, is optional, not compulsory.

Noon strikes,—and from the four entrances to the great works stream forth thousands of as bright-faced, intelligent, well-dressed looking people as are found on the main street of any great city. It is plainer now why these native New Englanders demand such good living wages. Many of them are the third generation of Waltham watchmakers. Some are children of watchmakers on both sides, their fathers having worked all their lives in the factories, and their mothers until they married. At their work these people wear neat blouse-aprons like art students, and such they might well be; their interest in and co-operation with the work are a marvel to any one who has seen the ordinary "factory town."

Despite the constantly lowering price of the Waltham, higher wages are paid these watch experts than any others in the world get: Men, $4 a day up to $6 for the skilled adjusters; women, $1.25 to $2.50. This is against the prevailing Swiss rate of $1.50 to $3 for men, and 50 cents to $1 for women.

THE SOUL OF THE MACHINE—JUGGLING WITH THE INVISIBLE.

Microscopic delicacy comes to the eye, hand, and even ear of the expert operators. Simply by listening to the different tones of the tick, an adjuster will locate little frictions of other sources of irregularity.

As Kipling phrased it, any high-bred machine has a soul, must "find itself." In a watch this soul lies in the escapement. And Lilliputians might envy the refinement of touch of the craftsmen who "match" the Waltham escapements. Some of the parts are so minute that there is no question of *dimension,* but only of *effect.* To make the tiny prongs of the "fork" release just one tooth of the balance wheel at a time, with the precise lock and slide that will never vary for generations of men, depends more on the expert's instinct than on his sight, even

through a microscope. So exacting is this strain of *fitting the invisible* that experienced, trained men sometimes break down in fits of nerves.

Many more operators besides must be able to spot a difference between correct and incorrect, which simply doesn't exist for the average eye, however keen.

The company's lapidaries examine microscopically the finest jewels nature has produced, condemning for the slightest flaw or other imperfections. Examiners, secure from intrusion in a guarded room, oscillate all balance wheels and hairsprings for five-minute periods measured to a tick, in comparison with models which show the standard of 18,000 vibrations per hour.

"17,999 won't do,—it must be 18,000," said the superintendent here.

Special instinct is also possessed by the "assemblers," who bring together the mainspring in its "barrel" and the "train" of wheels which it drives.

MENTAL ANALYSIS BEATS SLEIGHT OF HAND.

Not sleight of hand, however, but mental analysis, is the spring of this wonderful nicety. In mere manual dexterity the Swiss and French watchmakers lead the world. Special instances abound of delicate, patient handicraft, such as that of Louis Leroy, of Paris, who built a good watch inside a twenty-franc gold piece! But in turning out, by the thousand, timepieces which shall be uniformly correct, even as regards the regulation of handwork, American analytical principles have beaten the world.

Spectacularly is this the case with the machines, elaborate marvels of preordination. I have watched a double-cylinder printing press, and a sock-knitting machine, and the wonderful doings at the mint at Philadelphia, but the greatest "Yankee tricks" of all are up there by the Charles River.

ONE HUNDRED AND FORTY OPERATIONS BY ONE MACHINE.

The sleek, well-oiled brass and steel, intricate, uncanny, certain as death, clatters out watch-parts contemptuous of aid. One machine makes 140 different operations before yielding its "part" to human interference.

"Automatic" gathers a new meaning here. One of the thousand weird "transfer arms" grabs a piece of a watch (maybe a plate the size of a silver dollar, or a pin as big as a flea), sets it down in front of some lurking device, which immediately jumps out and drills holes in it, or chews "recesses" out of it, or makes it into screws, or turns it into seven different diameters,—and then passes it on to the next "transfer arm," which opens up a further life of strenuous intricacy for the young part.

Shavings from tools are brushed away by oiled brushes, or blown away by compressed air, or washed away by oil jets,—all automatically. Variable speed motors run machines first fast and then slow. Clacking, whispering cutters feed metal disks into themselves and whack out little toothed wheels while you look.

Automatic, too, is the very engraving of trademark and number, which are pneumatically punched upon the plate in a few seconds, where formerly hours and hours had to be spent by a hand engraver.

The end of a piece of wire becomes a tiny toothed wheel 1-32 of an inch in diameter, —automatically. Another piece of wire is turned into perfect little screws so small that 25,000 of them fill about half an inch of a pint jar,—automatically.

THE TWO INVENTIONS THAT DID IT.

Two great inventions lie behind these miracles,—the first Church's development of the "slide-rest" (that attachment of a lathe which carries the *work*), and of the rotating, cylindrical "turret" (the lathe attachment that carries the *tools*).

By the use of compressed air, Church moved these parts with the hairbreadth exactness which the watch demands, without extra mechanism and without the slightest wear!

The persistent "transfer arms" form the second of his great improvements. These two inventions not only revolutionized watchmaking; they point the way to the complete finishing of any metal piece without the touch of human hand.

The mechanism of the 3700 operations needed for the 172 (or so) parts of a Waltham is so interwoven and elaborate a fabric, that to increase the output of the factory by only 200 watches a day, a year's preparation is necessary. From only one of the departments the number of separate parts turned out daily averages 380,000.

Yet, with all this impersonality, no skimping is allowed. It takes half a year's progress of a high-grade Waltham through those 22 departments before the scrupulous inspectors pass it as "O. K."

WHERE HUMAN LIFE HANGS ON THE BALANCE WHEEL.

American railroads have killed many less people by accident each year since they have been regularly testing all employees' timepieces. Nowadays, subinspectors at different points along the road periodically collect all watches for a scrupulous comparison with the standard, allowing a maximum variation of 30 seconds a week. A watch that "fails" on being examined is condemned, and no railroad man may use a condemned watch.

Now, a majority of the watches that railroad men *do* carry are Walthams. The reason: This watch, by the very nature of its birth and environment, contains *better values* than any other.

First value: The parts are more accurately made. Its leadership in the field of watch machinery invention has already been described.

Second value: The raw materials are better. Every manufacturer will realize that the greatest plant in its industry does not have to seek raw materials, but that the best are brought to it and urged upon it. By buying in tremendous quantities, moreover, the actual cost of production can be lessened. In many instances there has not yet been found any American material fine enough for this high-grade product. The hairsprings are made of English wire (which has to pay a 45 per cent. duty), merely because the American wire has not yet come up to the test. And even then there is a lot of rolling and drawing (the final drawing, by the way, is through *diamonds*), before the spring is coiled.

Third value: Co-ordination is complete. Perhaps the greatest profit to the user of a Waltham watch that the organization of its makers brings, lies in the fact that, to a greater extent than with any other watch manufacturer, all their operations are performed under one roof. The watch case has been standardized in recent years,— that is to say, there are regular sizes of movements which fit corresponding regular sizes of cases. So the making of cases has become a separate industry in itself. But, excepting the case, there is not a part of the Waltham watch which is not manufactured on some section of their seven acres of floor space.

The immediate advantage of co-ordination that this gives, by itself makes the watch a better fitted instrument than any other. The difference between the manufacturer who controls the shaping of every one of the 172 or so parts, and the man who has to buy some of them from other people, is obvious, As the master mechanic told me: "We don't have to fit the Waltham watch, only to assemble the parts." Machines are so perfected that the parts are fitted when they are made. Only in minute operations like the matching of the escapement, referred to above, is it necessary to supplement machine work by hand.

Fourth value: The labor is higher grade. Of the high prices paid to operatives we have already spoken. The fittings and adjustments of a Waltham are scrutinized by the best nourished, best trained and most skilful set of watch artificers in the world. The "human equation" here is a high power one.

A FORTUNE TO GET "THE RIGHT TIME."

Fifth value: The Waltham is better regulated. The first thing in watch regulation is to know the right time. To get this knowledge a fortune has been spent at Waltham. The Washington Naval Observatory inspects only chronometers and so forth. The Kew Observatory in England, the world's standard, is too far away for daily reference. So the Waltham folk have built their own time equipment, an observatory and a clockroom pronounced superior to that of either English-speaking government. Here the Waltham is made to tick in time with the immutable constellations themselves.

In the brick-piered observatory, Duncan, the Waltham astronomer, sights fixed stars through the transit instrument (a larger, new transit is just being built). When a star passes the Waltham meridian he notes the time, checking himself at five different stages. Having gone as high as heaven for authority, he can regulate his "star-time clock." (Star-time is depended on by watchmakers as being constantly accurate, whereas "sun-time" varies day by day.)

This clock is the heart of the finest clockroom in the world, deep below the factory, fitted with master clocks, chronograph, thermostat, and all the finest apparatus needed, built under the advice of the Harvard faculty, the Crookes, Clarks, and other authorities, scientifically protected from vibration, moisture, or temperature change. Its throbs are automatically telegraphed, second by second, to every department concerned in watch regulation.

THE BLUE RIBBON OF TIME.

This "star-time clock" has varied less

than three-hundredths of a second in nine months. Think of the 45-day test as prescribed by the International Congress (often repeated two or three times) which every Waltham watch must undergo in face of this cold, unaltering tick, in different positions and at different temperatures,—and now it is easy to understand why, among the hundreds of these watches examined by the Kew Observatory (about 50 times as many as any other manufacturer has ever submitted), 86 per cent. have received the "Kew A," which may be called the Blue Ribbon of Time.

The Waltham remains in the first class of regularity, because other makers, even if they could afford like time for adjusting, are not equipped to check up their work by the orbits of the stars themselves.

Nor are astronomers the only scientists who daily work and think for the good of the Waltham. Crystallographers superintend the working-up of all the finer grades of jewels; chemists, the gilding of the "plates," the composing of the metals, the welding together of brass and steel in the balance wheel (so that the expansion and contraction, resulting from inevitable changes of heat and cold, are made self-correcting), the making of enamel, the use of acids for cleaning, etc.; mathematicians work out the stupendously complicated mechanical drawings for the machines, determine the epicycloidal curves of the wheels, etc.

A spirit of exactness, a determination for accuracy, animates the skilful machinists here which would give joy to a professor of natural science in any American university.

BE GUIDED BY AMERICAN HISTORY.

You, reader, hearing of this half century of science and effort, have received an education of practical value.

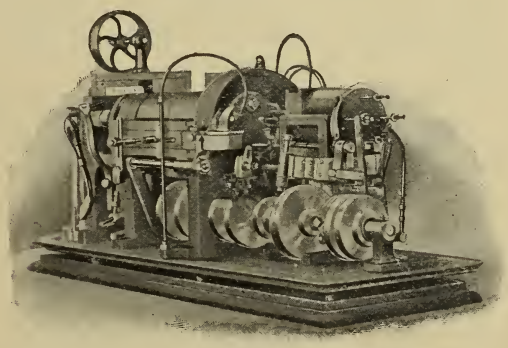
You can use your own judgment on watch movements. Look for the maker's name. The case, being made separately, has nothing to do with it; at $5 or $500, you can be guided by your taste. But when it comes to the movement, be guided, not by what you think or what the jeweler thinks, but by American history. If it bears the Waltham stamp, you are getting the most permanently guaranteed and accurate watch to be had at any price. And the prices run to suit all conditions of purses.

The company now knows the location of scores of watches *still running regularly* that were made in the first five years of its experience,—a generation and a half ago!

CAUTION! GET A COMPETENT "GROOM."

This is very important: before you buy any kind of a watch, make sure the dealer is both honest and competent.

A high grade watch needs to be "groomed,"—cleaned and oiled,—at certain intervals. For this reason, only a dealer skilled in watch treatment and "grooming" can be trusted to deliver the timepiece to you in satisfactory order. A merchant without special training, by his ignorance and neglect, may "lame" the most perfect-running watch ever built,—one of a lot that 4000 people, backed by half a century's experience and twelve millions of capital, have labored six months to produce.



"ELABORATE MARVELS"—THIS MACHINE MAKES A PIECE OF WIRE INTO TINY BUT PERFECT SCREWS.

Such a dealer may deliver the sensitive workmanship to you suffering from bad treatment, in an "ungroomed" condition, for which the original makers certainly ought not to be held responsible, any more than the breeders of a sensitive race horse ought to be held responsible for the shock caused by blows and neglect of trainmen and horse dealers that bring the animal to the buyer.

This is an especially apt simile for watches, because it is in transportation that many a fine timepiece is sadly disorganized. I refer to transportation by mail. Such shocks as the instrument gets thus are fatal to good timekeeping. And even the man who repairs temporary damage done to a watch in transportation must be a watch-craftsman.

Just the proper fitting of the movement to the case (you will usually buy these two separately), calls for a machinist of skill and special training.

Again, take a watch which has been lying "dead" (not running) in the merchant's stock for six months or more,—such a watch needs just the right oiling and freshening before being "brought to life" by the purchaser. This treatment the trained watchmaker only is fitted to give.

WHAT THE DEALER'S REPUTE MAY MEAN TO YOU.

The professional watch dealer, then, is the only medium to you for good watches in good order. And it is vital also to pick out a merchant whom you know to be of good repute.

Complaints constantly come in from those who have bought an undoubted Waltham movement, but find afterward that the *case* recommended with it is fraudulent,—the gold below standard, perhaps, or the workmanship inferior.

The Waltham Company makes no cases, so it does its utmost in warning you against any but dealers of high class, whose word you can trust.

Again, although your movement be a genuine Waltham, it may not be a new one. A constant stream of second-hand watches, bought at pawnbrokers' sales and the like is being offered to the public by unscrupulous dealers who polish each watch a little to look new. Such a watch, of course, may have been grossly mistreated for years, and cannot be depended on like one sent direct from the factory to an honest, careful retailer.

Your closest friend through life,—your watch,—must not be cared for and fitted out by any but the highest-skilled in their profession, and the honestest.

"THE PRICE IS RIGHT."

American watchmakers are subject to the competition of the Swiss watch in this country, and also to competition between each other. I have been assured on respected and qualified authority that there is no community of interest between any of the leading manufacturing concerns in this country.

There were seven hard years for the makers of the Waltham watch, from 1854 to 1861. Faith in their star was about their only asset; all the cash had gone into the business. In 1860, a dividend of 5 per cent., the first ever declared on American watchmaking, was announced by the company. Since then their capital invested has steadily increased from $300,000 to $12,000,000. Investment in buildings, machines, and payroll has kept pace with increased issue of stock.

This money is all working; and the income of the company has been earned over and over, every cent of it.

If American watchmakers are taking in too much money, the tariff adjusters will get them. The indisputable fact is that the Waltham Company makes the standard watch of the world, and that "The price is right."

ROOSEVELT ON FOOTBALL AND BUSINESS.

"Hit the line hard. Don't flinch; don't foul; but hit the line hard."

Theodore Roosevelt's words express the American ideal of commerce as well as of football. This has been the conduct of the watchmakers at Waltham.

"*Don't flinch;*" improve machinery at any cost, open foreign markets at any cost, organize more perfectly at any cost.

"*Don't foul;*"—give labor its due; give the retailer his profit; give competitors a fair field. The Waltham Company announces that its backers own not a cent of stock in any other watch company. It has earned its *good-will* by merit alone.

"*But hit the line hard.*" As the president of the company said to me: "This enterprise is not an accident. It has been built up by the intense personal application of competent people."

SOMETHING FOR AMERICANS TO BE PROUD OF.

Here we are again back to good-will, the quality in which Americans take such pride. The Waltham good-will, its reputation of first all over the world, has been earned by activity,—and activity not in outward conquest, but in internal improvement.

By exertion, not by absorption, the Waltham industry has thrived. So far from "combining," waxing fat upon the result of others' work, it has itself been the training school for nearly all the practical Americans who have set up rival watch factories. That it has consistently delivered a better watch than any of them, means that it has consistently displayed better brains, higher ideals of perfection, and more everlasting energy.

Americans back from a trip abroad have recalled their proud "home feeling" when noticing Waltham watches offered for sale in every important city of the world.

The seven letters in the word "Waltham" spell a career of clean-cut, earnest, triumphant effort,—a career of which every earnest American may well feel proud.

The following table shows the increase in the number of WALTHAM watches in use from 1854 to 1907:

1854	375 in use
1864	128,889 in use
1874	750,122 in use
1884	2,514,736 in use
1894	6,409,349 in use
1904 . . .	12,000,000 in use
1907 . . .	15,000,000 in use

HOW A WALTHAM WATCH SET ENGLAND'S TIME

26 Ormiston Road, Westcombe Park,
London, S. E., England.

10-2-'97.

American Waltham Watch Co.,
Waltham, Mass., U. S. A.

Gentlemen: About three years since, acting on the advice of a friend who had had one of your watches for about eighteen years, I purchased a Lever Waltham Watch. I am happy to say it has turned out a marvel of accuracy, and under the circumstances I feel I am only doing my duty in bringing this fact to your notice. . . . But perhaps its most unique performance, and the one of which I am especially proud is the fact that by its aid I was able to *detect an error in the fall of the time-ball at the Royal Observatory, Greenwich*, which gives the standard time to the civilized world. It happened as follows: I make a practice of watching the fall of the time-ball each day at one o'clock p. m., whenever the air is clear enough, and one day, to my surprise, I found the ball had dropped some few seconds before I had expected it to. *I had such confidence in my watch that I did not believe it was at fault, and I felt sure that some mistake had been made at the Observatory.* On telling some of my friends of my convictions, I was simply laughed at for my impudence in daring to pit my Waltham watch against the accuracy of the Royal Observatory. However, to set the matter at rest, I wrote to the Astronomer Royal telling him of my conviction, and asking him if he would let me know whether I was right or wrong. *In return I received a courteous reply from the Astronomer Royal, stating that I was quite right*, and that on the day named, owing to an accident, the ball was dropped about eighteen seconds too soon. This seems to me such a remarkable proof of the reliability of your watches that I feel justified in bringing it to your notice. If you would care to have the Astronomer Royal's letter as a memento, I should be pleased to hear from you to that effect. Wishing every success and prosperity to your deservedly world-famed Company, I remain,

Yours very sincerely,

THOMAS WHEATE.

The Reply from the Astronomer Royal

Royal Observatory, Greenwich, London, S. E.
1894, March 10.

Dear Sir: In answer to your letter of yesterday, the Astronomer Royal requests me to inform you that on Thursday last the time-ball was, through an accident, dropped about eighteen seconds before one o'clock.

Yours truly,

H. P. HOLLIS.

T. WHEATE, Esq.